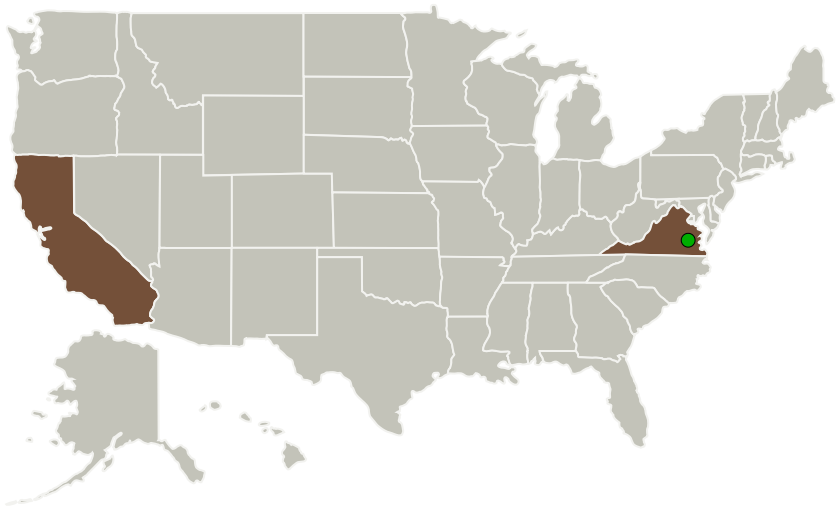
Thermal Protection Systems Nondestructive Evaluation Tool, Phase I

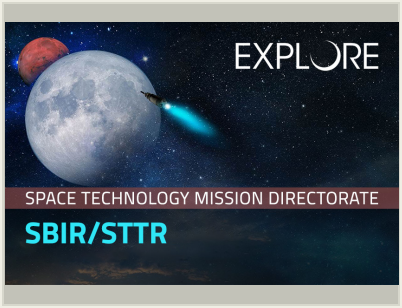
Completed Technology Project (2014 - 2014)

Project Introduction

To address NASA's need for evaluation of bondline and in-depth integrity for lightweight rigid and/or flexible ablative materials, Physical Optics Corporation (POC) proposes to develop a novel Thermal Protection System Nondestructive Evaluation Tool (TERRET) providing accurate in situ detection, identification, and spatial localization of internal and surface defects (cracks, voids, delaminations, porosity, and inclusions), and evaluation of bondlines and in-depth integrity of lightweight, rigid, and/or flexible ablative materials and large-area multilayer thermal protection system (TPS) structures with complex geometries. TERRET is based on the POC-patented innovative X-ray Compton imaging tomography technique and POC-patented apodized aperture X-ray imaging optics with high spatial resolution and a wide field of view, substantially modified and optimized to meet NASA's requirements for operation on a wide range of lightweight TPS materials, noncontact operation, portability, and ease of use. TERRET will provide detection and spatial localization of defects and damage in TPS material and structures, with spatial resolution of ~1 mm and sensitivity of 1% in material density difference. In Phase I POC will demonstrate the feasibility of TERRET for NDE of TPS by fabricating and testing a TRL-4 prototype, with the goal of achieving TRL-6 by the end of Phase II.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Physical Optics Corporation	Lead Organization	Industry	Torrance, California
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139383)*

Images

Briefing Chart
Thermal Protection Systems Nondestructive Evaluation Tool, Phase I
(https://techport.nasa.gov/image/131565)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Physical Optics Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Naibing Ma

Co-Investigator:
Volodymyr Romanov

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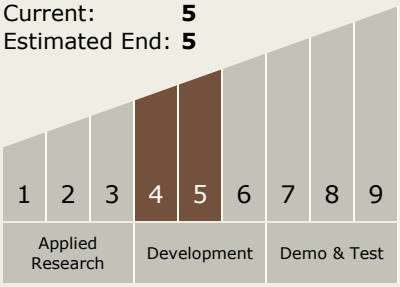
Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.5 Modeling and Simulation for EDL

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System